

## REMARKS

### I. Amendments

Claims 1, 3, 8, 10, 14, 17, 18, 22, and 24 have been amended.

Claims 4, 11, and 12 have been cancelled.

New claims 27-44 have been added to the specification.

Both independent claims 1 and 17 are amended to define the hydrocarbon oil feed as having a boiling range of from 300 °C to 620 °C. The Examiner noted in his “Response to Arguments” that the aforementioned boiling range was not recited in the claims. Also, claim 1 is further amended to require the dehydrogenation component of the catalyst composition to either be platinum, palladium or nickel. The Examiner noted in his “Response to Arguments” that certain of the claims are not limited to specific metals. The amendment to independent claim 1 specifically requires the hydrogenation component to either be platinum, palladium or nickel. These metals are expressly disclosed in the specification. As for independent claim 17, the recited hydrogenation component is nickel.

Dependent claim 10 is amended to clarify that the hydrocarbon oil feed is a solvent extracted waxy raffinate and its source.

The remaining amendment to claims 3, 8, 14, 18, 22, and 24 are to provide better clarity and correct certain errors in the text.

New claims 27-44 include two independent claims 27 and 36. Claims 28-35 depend from claim 17, and claims 37-44 depend from 36. Claim 27 recites process steps which require the catalytic dewaxing of a solvent extracted waxy raffinate obtained by the solvent extraction of a heavy vacuum distillate having a boiling range of from 300 °C to 620 °C and a sulfur content exceeding 1000 ppmw. The catalytic dewaxing is conducted with the specifically recited catalyst composition. Claim 36 recites the process steps that require the catalytic dewaxing of a heavy vacuum distillate having a boiling range of from 300 °C to 620 °C and a sulfur content exceeding 1000 ppmw. The catalytic dewaxing is conducted with the specifically recited catalyst composition.

## II. §103(a) Rejection of Claims 1, 3-11, and 14-26

Claims 1, 3-11, and 14-26 have been rejected as being obvious over Gorring et al. (U.S. 3,894,938) in view of WO 98/01515 to Moureaux. Reconsideration and withdrawal of this rejection are respectfully requested in view of the amendments to the claims and the following remarks.

The Gorring et al. patent discloses a process for catalytically dewaxing a gas oil feed having a boiling range of from about 204 °C to 482 °C and containing sulfur and/or nitrogen. *See* column 2, lines 14-15, 51-56; column 3, line 53 – column 4, line 29; and claim 1. An important aspect of the invention of the Gorring et al. patent is the particular sequence of the processing steps, *see* column 2, lines 48-56; and column 3, lines 35-46; and, further, it is preferred for the gas oil feed of the inventive process to have a total sulfur and nitrogen content of at least 0.1 wt. percent and 10 ppm, respectively. *See* column 2, lines 55-59. The Gorring et al. patent notes that the conventional thought among those skilled in the art is that sulfur containing gas oils should be catalytically hydrodesulfurized prior to dewaxing. *See* column 1, line 66 – column 2, line 7; and column 2, lines 14-18. But, in the Gorring et al process, the sulfur containing gas oil first undergoes a catalytic dewaxing step followed by desulfurization. *See* column 2, lines 48-56; column 3, lines 12-19; column 4, lines 25-26; and claim 1.

The dewaxing catalyst of the Gorring et al. process includes ZSM-5 type zeolite having incorporated therein a hydrogen transfer functional component. *See* column 2, lines 59-61, and 64-67. The hydrogen transfer functional component includes nickel, palladium, or platinum and is present in the dewaxing catalyst in the range of from about 0.5 to 5 weight percent of the total weight of the dewaxing catalyst. *See* column 2, line 64 – column 3, line 2. The dewaxing catalyst may be of the matrix type and contains from about 5 to 95 weight percent ZSM-5 type zeolite in the total catalyst matrix with the matrix material being alumina, silica, silica-alumina or other similar matrix materials. *See* column 3, lines 7-11.

The Moureaux publication discloses a process for the preparation of lubricating base oils that necessarily includes two reaction stages with an intermediate separation step between the two reaction stages. *See* Abstract; page 1, lines 2-8; page 5, lines 7-25; page 9, lines 30-32; page 10, line 31-page 11, line 18; page 17, line 31-page 18, line 4; claim 1; and Figures 1 and 2. The first reaction stage is a hydrotreating step used to remove sulfur and nitrogen from a hydrocarbon feed using a catalyst comprising both a Group VIB metal component and a non-noble Group VIII

metal component supported on a refractory oxide carrier. *See* page 5, lines 10-14; page 6, line 14-page 7, line 20. The importance of the sulfur and nitrogen removal reaction step is emphasized. *See* page 9, line 1-page 10, line 3. It is noted that the noble-metal based catalyst used in the second reaction step is sensitive to poisoning by sulfur and nitrogen. *See* page 9, lines 9-15.

The product from the first reaction step is to be separated into a gaseous fraction and a liquid fraction. *See* page 9, lines 30-32. The first reaction step is to be operated so as to provide the liquid fraction having less than 1000 ppmw sulfur and less than 50 ppmw nitrogen. *See* page 9, lines 1-7; page 9, line 32-page 10, line 3. But, it is preferred for these concentrations to be lower such as less than 500 ppmw sulfur and less than 30 ppmw nitrogen. *Ibid.*

The second reaction stage may provide the two functions of hydrofinishing (hydrogenation of aromatics) and hydrodewaxing (hydroisomerization), or a single function of hydrofinishing alone, configured in a variety of ways. *See* page 10, line 31-page 11, line 33. In the case where the second reaction stage provides for the two functions, the hydrodewaxing function precedes the hydrofinishing function. *See* page 11, lines 22-29; page 14, line 4-page 16, line 5. Thus, in accordance with the invention, the liquid fraction undergoes a catalytic hydrofinishing treatment after a catalytic hydrodewaxing treatment, but the catalytic hydrofinishing treatment may be conducted when there is no prior catalytic hydrodewaxing treatment.

The hydrofinishing catalyst comprises a noble metal component, such as platinum and palladium, supported on an amorphous refractory oxide carrier. *See* page 12, line 1-page 13, line 3. It is important for the carrier to be an amorphous refractory oxide, with it being understood that the refractory oxides exclude those of zeolitic nature, such as aluminosilicates and silica-aluminophosphates. *See* page 12, lines 21-25.

The dewaxing catalyst may be selected from those known in the art, such as, dewaxing catalysts comprising a noble metal (platinum or palladium) supported on an intermediate pore size zeolitic material. *See* page 14, lines 13-27. Another class of dewaxing catalyst comprises a noble metal component supported on a surface deactivated aluminosilicate. *See* page 14, lines 27-31.

The cited references may not be combined in the way the Examiner has combined them; since, there is no motivation presented in the references themselves to suggest such a

combination. See MPEP § 2143.01. Instead, the references themselves actually teach against the Examiner's suggested modification of the primary reference of Gorring et al. by the secondary reference of Moureaux. Moreover, the comparative examples in the Applicants' specification show the improvements in its dewaxing process, which uses a dewaxing catalyst comprising a Group VIII metal component, dealuminated aluminosilicate zeolite, and a low acidity refractory oxide binder material that is essentially free of alumina, as compared to a dewaxing process that uses a conventional ZSM-5 type dewaxing catalyst.

The Examiner notes that the feed to be processed by the Gorring et al process is different from the feed recited in the Applicants' claimed invention, and he notes that the dewaxing catalyst of the Gorring et al process is different from the dewaxing catalyst of the Applicants' claimed process. But, the Examiner argues that it is obvious to modify the Gorring et al process to utilize the Applicants' claimed feed; because, the feeds are, allegedly, chemically and physically similar. The Examiner, thus, expresses the erroneous conclusion that the Gorring et al. process would be expected to effectively treat the Applicants' claimed feed in the same way as the Gorring et al. process treats its feed.

The Examiner also argues that it is obvious to modify the Gorring et al. process to replace its use of ZSM-5 type dewaxing catalyst with the use of a dewaxing catalyst such as the dealuminated zeolite catalyst disclosed by the Moureaux publication. The Examiner argues that this modification is obvious because the Moureaux catalyst is effective for the desired reaction of the Gorring et al. patent. The Examiner presents this argument in spite of the fact that the Moureaux publication actually teaches against the effectiveness of its taught catalyst in a process such as that taught by the Gorring et al. patent and in spite of the fact that without the teachings of the Applicants' application one skilled in the art would not have known that the Moureaux catalyst would be effective in the process as claimed by the Applicants.

Without citing any authority or reference to support his assumption, the Examiner makes the conclusory statement that the Applicants' claimed feed is chemically and physically similar to the feeds taught by the Gorring et al. patent. The Examiner, however, is required to support such a technical conclusion with the citation of art, which he has not done. In any event, the Applicants' specification and the Gorring et al patent both suggest that their respective feeds are indeed different. The Applicants' claimed feed is a vacuum distillate, which has a boiling range between 300 °C (572 °F) and 620 °C (1148 °F). *See* the specification at page 4, lines 22-35 and

claim 1. The feed of the Gorring et al. patent, on the other hand, is gas oil boiling in the range of from 400 °F to 900 °F and includes such petroleum fractions as kerosene, diesel fuel and heating fuel. *See* column 1, lines 6-10; and column 2, lines 14-19. Implicit in the language of the Gorring et al. patent is that the noted gas oil, having the specified boiling range, has different properties from other petroleum fractions.

The Examiner further presents the unsupported conclusion that it would be expected that the Gorring et al process could effectively treat the Applicants' claimed feedstock. But, there is absolutely no suggestion within the Gorring et al. patent that a feedstock other than the one specifically mentioned by Gorring et al. may be suitably treated by its process. Furthermore, the Moureaux publication actually suggests that its dewaxing catalyst would not be effective in the type of process taught by the Gorring et al. patent. The Moureaux publication speaks to the importance of its desulfurization step for reducing the sulfur and nitrogen content of its feedstock prior to the dewaxing step. *See* page 9. The Moureaux publication further states that it is known that noble metal-based catalysts are sensitive to and quickly poisoned by sulphur and nitrogen feed contaminants. *See* page 9. The process disclosed in the Moureaux publication requires the sulfur and nitrogen content of its feedstock to be substantially reduced prior to the dewaxing step. *See* page 9.

As for the teachings within the Applicant's patent specification, comparative examples are presented that demonstrate that the Applicants' claimed process performs unexpectedly better than a process similar to the one taught by the Gorring et al. patent. The Applicants' examples present comparisons of dewaxing performance in the treatment of a sulfur-containing gas oil when using conventional gas oil dewaxing catalyst and when using the inventive dealuminated ZSM-5 catalyst. *See* the specification at pages 14-23. The conventional catalyst used in the Applicants' comparative examples is similar to the catalyst described in the Gorring et al. patent, and it contains untreated ZSM-5, alumina binder, and nickel. *See* the specification at page 17, lines 5-15. The catalyst of the inventive process contains dealuminated ZSM-5, silica binder and a Group VIII metal. *See* the specification at pages 14-18.

Considering the teachings of the Moureaux publication that the feed to be treated using its catalyst should have a low sulfur concentration, and considering the teachings of the Applicants' patent specification that conventional dewaxing catalysts similar to those taught by the Gorring et al. patent do not perform as well as Applicants' claimed catalyst in the dewaxing of a sulfur-

containing feedstock, it is clear that Applicants' claimed invention is unobvious over the art cited by the Examiner.

### **III. §103(a) Rejection of Claim 12**

This rejection has been rendered moot due to the cancellation of claim 12.

### **IV. Response to Examiner's Response**

The Examiner continues to argue that it is proper to combine the Gorring and Moureaux references in such a manner that the dealuminated zeolite catalyst of Moureaux is substituted for the ZSM-5 dewaxing catalyst of Gorring. The rationale expressed by the Examiner to support such a combination is that both references teach the same catalytic dewaxing reaction and that one skilled in the art would be lead to substitute the Moureaux catalyst for the Gorring catalyst and still expect the substitution to result in an effective dewaxing of the Gorring feed. The Examiner further rejects as being non-persuasive the Applicant's argument that the references teach opposing sulfur concentration levels in the feeds to be dewaxed. He argues "there is essentially no difference in the sulfur contents when one compares the upper sulfur limit of the Moureaux with the lower sulfur limit of Gorring."

The Applicant, however, respectfully asserts that the Examiner's combination of the references is improper and that one skilled in the art would not be lead to combine them in the manner as has the Examiner. The Gorring patent states that it is a preferred aspect of its invention for the gas oils to which its process is directed to have a total sulfur content of at least 0.1 wt. percent, see column 2, lines 56-59; however, on the other hand, the Moureaux publication indicates that the sulfur content of its liquid fraction that is to be catalytically dewaxed "must [emphasis added] be less than 1000 ppmw". See page 9, lines 1-7. Moureaux notes that it is well known in the art that noble metal catalysts are sensitive to and quickly poisoned by sulfur and nitrogen. See page 9, lines 9-15.

The Applicant respectfully asserts that the teachings of the two references are in conflict; since, the primary reference of Gorring indicates that its feedstock to be dewaxed has a high sulfur content, but the secondary reference of Moureaux indicates that its feedstock to be dewaxed must have a low sulfur content. Moreover, the Moureaux reference teaches that certain dewaxing catalysts are sensitive to and are quickly poisoned by sulfur. Therefore, due to the

conflicting teachings of the two references, they are not combinable in the manner by which the Examiner has combined them.

The Examiner also continues to argue that the Applicant's claimed feed is chemically and physically the same as the feeds of the Gorring patent. The Examiner supports his position by noting that the Applicant's claim 11 claims a gas oil feed. He further argues that the Applicant's feed boiling range of from 300 °C to 620 °C is not claimed, and it overlaps the boiling range of the Gorring feed of from 204 °C to 482 °C.

The Applicant has addressed several of the Examiner's objections by canceling claim 11 and by amending independent claims 1 and 17 to require the recited hydrocarbon oil feed to have a boiling range of from 300 °C to 620 °C.

As for the argument that the feedstocks are similar because their boiling ranges overlap, the Applicant respectfully disagrees and asserts that the different boiling ranges of cuts from crude petroleum provide for significantly different products or feedstocks. There are plenty of examples to illustrate the differences. For instance, the boiling ranges of gasoline and kerosene overlap, but the products are significantly different and have different uses. Also, the boiling ranges of kerosene and diesel fuel overlap, but, again, the products are significantly different and have different uses. And, by analogy, the claimed feedstock and that of the Gorring patent are different due, in part, to the differences in their boiling ranges.

As for the Examiner's response to the Applicant's arguments concerning the unexpected results presented in the Examples that the specific metals of the examples are not explicitly recited in the claims, independent claim 1 has been amended to define the Group VIII metal hydrogenation component to include platinum, palladium or nickel. As for independent claim 17, it already requires the presence of a nickel hydrogenation component in its recited catalyst.

The arguments with respect to claim 12 are moot due to the cancellation of claim 12.

## **V. New Claims 27-44**

New claims 27-44 have been added to the specification. These claims have been added to address a number of the issues raised by the Examiner in his prior office actions.

Independent claim 27 is directed to a catalytic dewaxing process that is distinguishable over the cited prior art in a number of ways. The feed that is being catalytically dewaxed is a solvent extracted waxy raffinate that is derived from a vacuum distillate having a high boiling

range of from 300 to 620 °C. The solvent dewaxed waxy raffinate also has a high sulfur concentration that exceeds 1000 ppmw. Further recited in the claim is that the solvent extracted waxy raffinate is not to be hydrotreated prior to its catalytic dewaxing. Also a requirement of the catalytic dewaxing step is the use of a specifically defined catalyst composition.

Dependent claims 29, 30, 31, 32, 33, 34 and 35 further define the dewaxing catalyst of the claimed process. It is significant to note that dependent claim 35 requires the absence of a Group VIB metal component from the catalyst composition.

Independent claim 36 claims a catalytic process similar to that of claim 27 with the exception that the feed that is being catalytically dewaxed is the heavy vacuum distillate that has not been subjected to a solvent extraction or hydrotreating prior to the catalytic dewaxing step. It is noted that the heavy vacuum distillate has a high boiling range of from 300 to 620 °C and a high sulfur concentration that exceeds 1000 ppmw.

Dependent claims 38, 39, 40, 41, 42, 43 and 44 further define the dewaxing catalyst of the claimed process. It is significant to note that dependent claim 44 requires the absence of a Group VIB metal component from the catalyst composition.

## VI. Conclusion

In view of the above amendments and remarks, the Applicant respectfully asserts that the claims now pending in this application are patentable. Early allowance of claims 1, 3, 5 - 10, and 14 – 44 is therefore respectfully requested.

Respectfully submitted,

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